in advance. In about twenty minutes ·920 in. of rain was collected in the rain gauges. The path of this storm, from all accounts I can collect, appears to have been very narrow, and most violent in the northern parts of the city. The hail-stones were not large. On the following day the barometer rose rapidly, the weather was cold but fine during the morning, and after mid-day large *cumuli* and *nimbi* formed, and showers of hail and rain fell. At Geelong the storm was not felt.

It is not my intention to enter into any discussion of the many probable causes of the decrement of caloric suggested by such details as above described. Atmospheric electricity is not yet sufficiently understood to enable us to explain its influence satisfactorily in connection with the great and sudden changes of temperature which so often occur during thunder storms. It is evident, however, that the old theory of a cold current of air blowing against a rain cloud will not explain such phenomena. From whence could such a cold current come? And under what peculiar circumstances could it preserve its temperature? The collision of two currents of air of different electrical states, whatever the previous temperature of those strata may have been, is immediately followed by violent changes both of humidity and temperature; before the equilibrium is restored, successive flashes of lightning are seen, and during the period of the storm the thermometer by its indications shows the extreme rapidity of the changes; and that the thermometer, at the surface of the earth, only very faintly expresses the alternations of heat and cold in the higher regions where the storm clouds are, is proved by the state of the wet bulb, which not unfrequently is altogether irreconcilable with rain, when rain is actually falling.

I have hastily compiled these notes; but they will not be useless if they direct attention to the most remarkable phenomena of our climate.

ART. XV.—*Report on the Steps taken in England to provide a Telescope for observing the Nebulæ of the Southern Hemisphere.* By PROFESSOR WILSON, M. A., Melbourne University.

THE Report which I have now the honour to lay before the Institute is little more than a narrative of the steps taken by the British Association for the Advancement of Science, in

conjunction with the Royal Society of London, in order to procure the erection of a telescope of great optical power, at some suitable station in the Southern Hemisphere. It has been drawn up in consequence of a wish to that effect expressed at a meeting of the Council of the Institute. I trust, however, that it will not be considered altogether out of place if I prefix a brief notice of some of the principal steps in the history of what has been called "Stellar Astronomy."

Before the invention of the telescope the total number of stars visible in the whole heavens might be differently estimated at from 4000 to 6000, according as the eye of the observer was more or less piercing, so that the whole number visible at any one time above the horizon would not exceed from 2000 to 3000. The first great step was made in 1610, when Galileo directed his telescope to the heavens, and announced that the luminous belt, called the milky way, was but a vast aggregation of stars.

Passing over the speculations of Keppler, we next find it stated by Huyghens, in a work published in 1698, three years after his death, that the stars are suns like our own; and the immensity of their distance was inferred by him from the absence of any discoverable parallax. For nearly sixty years this branch of astronomy was stationary, till Kant, in 1755, published his work on the theory of the Heavens, containing a series of speculations, many of which, viewed by the light of modern science, appear almost prophetic.

Lambert, about the same time, was carrying on a series of observations for determining the distance of the fixed stars, and their distribution in space, by comparing the light proceeding from them with that of the planets. He classified the stars in groups of various orders. Thus he considered the sun and planets as a group of the first order. Our sun and the fixed stars as a group of the second order. The milky way he pronounced to be a cluster of such groups of the second order, forming itself a group of the third order. And he propounded the hypothesis that the nebula of Orion was also a group of the third order; another milky way adjoining our own. He also assigns universal gravitation as the common bond of all these systems.

A few years later, in 1767, the Rev. John Michell also published a Memoir on the determination of the distance of the stars by photometric observations.

For the next half century the history of Stellar Astronomy is the history of the labours of Sir William Herschel, con-

tained in seventy-three memoirs, scattered over the thirty-nine volumes of the Transactions of the Royal Society from 1780 to 1818. The six principal points to which he directed his attention have since formed the six branches into which the study of the Fixed Stars has been divided.

1. On their Nature and Brightness.
2. On their Parallan.
3. On their proper motion in space.
4. On Double and Multiple Stars.
5. On Clusters and Nebulæ.
6. On the Construction of the Heavens and the Milky Way.

The labours of this great man, as a mechanician in forming his telescopes, as an astronomer in using them, and as a philosopher in reading the tale which they unfolded, are too numerous to admit even of an enumeration here. I cannot, however, refrain from making an extract from his Memoir of 1818.

"In the depths of the celestial regions we have recognised "up to the present time two different principles—the nebular "principle and the sidereal principle. The light of the nebu-"lous matter is comparatively very feeble, and, except in some "cases, invisible to the naked eye. It is in general widely "spread over a great extent of space, thus being concealed "from the view by its extreme feebleness. The light of the "stars, on the contrary, is comparatively very brilliant, and "concentrated in a point." Further on he states, that "It "is extremely probable that some of the cometic nebulæ, "many among the planetary nebulæ, and a considerable num-"ber of the stellar nebulæ, are disguised clusters of stars, "being plunged so far in the depths of space, that the guag-"ing power of the telescope has not yet reached them."

Though multitudes of these nebulæ have since yielded to the superior telescopic power that has been brought to bear on them, and shewn themselves as clusters of stars, yet the question of the existence of a nebulous matter distinct from the stars, and irresolvable by any telescopic power, is still far from settled. Dr. Whewell, the present Master of Trinity College, Cambridge, in an Essay recently published, speaking of the Magellanic Clouds, says, "In those regions of space "there co-exist, in a limited compass, and in indiscriminate "position, stars, clusters of stars, nebulæ regular and irre-"gular, and nebulous streaks and patches. These, then, are

"different kinds of things in themselves, not merely different "to us. There are such things as nebulæ side by side with "stars and clusters of stars. Nebulous matter resolvable "occurs close to nebulous matter irresolvable."

The consideration of the Magellanic Clouds at once brings us to the labours of Sir John Herschel at the Cape of Good Hope, where he spent the four years, from 1834 to 1838, in completing the survey of the heavens, commenced by his father, by adding to his catalogue the double and multiple stars and nebulæ of the Southern Hemisphere.

At the time when Sir John Herschel was thus working at the Cape, and when the best telescopes of the public and private Observatories of Europe and America, if not adding much to our knowledge of the nebulæ, were showing that the law of gravitation extended to those regions of space, by proving that many of the double stars described ellipses round each other under their mutual attractions, Lord Rosse was working in Ireland with untiring perseverance at the production of a telescope of vastly greater power than any yet attempted; and this, the six feet reflector, was so far finished as to be available in February 1845. Lord Rosse himself thus states the result in a report laid before the British Association at Birmingham in 1849. "In the first instance it was directed to "some of the brighter nebulæ in Herschel's catalogue. Many "of them were immediately resolved, and very frequently "the aspect and form of well-known nebulæ were completely "changed, fainter details not previously seen being brought "out by the great light and magnifying power of the te-"lescope."

Amongst the various results described by Lord Rosse in this report, the most remarkable is the discovery of the spiral arrangement, till then unknown, and undistinguishable with the inferior telescopes which had been previously used, but which has since been observed in many nebulæ. This and other new and symmetrical arrangements thus brought to knowledge, open up vast fields of inquiry as to the mechanical conditions under which they exist, and render it highly desirable that every possible step should be taken to increase our knowledge of those inexplicable objects. Impressed with the importance of the object, the Association resolved on applying to Her Majesty's Government "to establish a reflector "not less than three feet in diameter, at the Observatory at "the Cape of Good Hope, and to make such additions to the "staff of the Observatory as may be necessary for its effec-

"tual working;" and accordingly the following Memorial, drawn up by Dr. Robinson, the eminent Astronomer of Armagh, at that time President of the Association, was presented to Lord John Russell:—

"My Lord,—At the last Meeting of the British Associ-
"ation for the Advancement of Science, that Assembly came
"to a resolution which has been adopted by the Royal
"Society, and which therefore I am directed, conjointly with
"the President of that illustrious body, to lay before your
"Lordship.

"The purpose is, that the Government be requested to
"establish, in some fitting part of Her Majesty's dominions,
"a powerful reflecting telescope (not less than three feet
"aperture), and to appoint an Observer charged with the
"duty of employing it in a review of the Nebulæ of the
"Southern Hemisphere."

"In evidence of the high importance of such an investiga-
"tion, it is sufficient to refer to the way in which its proposal
"was welcomed by the British Association. That assembly,
"comprising upwards of 1500 persons, among whom were
"found almost every British name of scientific renown, and
"of whom all are more or less devoted to the pursuit of
"physical knowledge, may not unfairly be considered an ex-
"ponent of the national mind on such an occasion; and I
"have never seen it admit any similar resolution with a more
"enthusiastic approval.

"For the department of Nebular Astronomy is that which
"at present has the most powerful hold on public attention,
"and stands most in need of public assistance. Others are
"worked out by the pen and in the closet, or by instruments
"of easy attainment, and in establishments already fully
"organised: the only results which they can now yield are
"uninteresting except to a few, and are valued by the mass
"only from an instinctive perception of the glory which they
"confer on human intellect. But it is far otherwise with
"this; the mysterious forms on which it is employed are at
"present objects of universal curiosity, from their position,
"(outworks as it were of the universe), their evident analogy
"to the system of which we are a part, and which we may
"hope to study in them, and the Dynamic questions which
"the marvellous arrangements of many of them suggest. I
"may add, that in its origin it is almost exclusively ours;
"the fame which will reward its completion should be ours
"also. The history may be very briefly given. About

" sixty-eight Nebulæ had been ill seen and worse described, " when the elder Herschel was led to explore them by the " encouragement and aid of his sovereign George III. To " those previously known, he not only added 2500 more, but " by classing them, by clear and methodical description, and " directing attention to the relations which connect them with " other portions of the universe, he gave this branch of " astronomy its powerful vitality. His no less distinguished " son, following his example with even greater success, has " not merely extended the list of northern nebulæ to an " amount which would have ennobled any other name, but has " given the whole work complete precision by an accurate " determination of the position of all contained in his own " and his father's lists, thus placing them fully within the " reach of subsequent observers. Not content with this, he " transported to the other hemisphere those instruments which " had rendered such good service in our own, and has thus " enriched astronomy with 1600 more, equally well observed, " but beyond the reach of European astronomers.

" Yet powerful as those instruments were, a much nearer " approach to the extreme limit of *useful* optical power has " been made by Lord Rosse: it was therefore to be expected " that his telescope would add considerably to our knowledge " of the Nebulæ, and this has been fully realised. It was in " fact a communication of some results obtained by him which " directed the attention of the British Association to this sub- " ject, and excited a desire of having the same work performed " for the southern sky which he is accomplishing in our own. " That work implies a minute re-examination of at least all " the brighter Nebulæ of Sir John Herschel's catalogues; " embodied in drawings, based on micrometer measures, and " so correct that each of them may be referred to without " doubt by future astronomers as an *authentic record* " of the original's appearance at a given epoch. Of such " drawings we at present possess very few: most of the " sketches given by the Herschels are stated by them to be " made merely by eye; and even those that were more " accurately taken by them are found to require amendment " when compared with the appearances in more powerful " telescopes.

" A task of this kind can only be wrought out by severe " and long continued labour; and the instrumental means " required are such as very few individuals can obtain by " their private resources. Even in Europe there are but

"three telescopes known to exist which are capable of mak-
"ing any great additions to the discoveries of the Herschels;
"and those three are in the British Islands. This field of
"research is therefore still exclusively our own; and I trust
"your Lordship will share my feeling, that the nation's
"honor will be sullied if we let it be preoccupied in its most
"interesting portion by the energy and liberality of any other
"people.

"In submitting to your Lordship this request of the
"British Association, I feel it my duty to give with it some
"approximate estimate of the sum which might be required
"for its accomplishment.

"First, as to the instrument; it has been proved by the
"experience of Lord Rosse, Mr. Lassels, and others, that
"one of sufficient power can be constructed with certainty
"and at no overwhelming cost. I have made inquiries of an
"artist (with whose abilities in this line I am practically
"acquainted), and have come to the conclusion that a tele-
"scope similar to the smaller of Lord Rosse's, 3 feet aperture
"and 27 feet focal length, might be constructed for £2,000.
"This would include an equatorial mounting; clock-work,
"to make the telescope travel with a star; apparatus for
"supporting the observer; and a machine for polishing the
"speculum, when that operation may be required. If a second
"speculum were supplied (which seems almost essential in
"case of accident), it would add about £500 more. Of
"course, some latitude must be allowed in this, but it need
"not be wide; the work could not be completed in less than
"a year, possibly would employ two. As telescopes so
"gigantic are erected in the open air, no outlay would be
"necessary for any building except the Observer's dwelling.

"Secondly, the Observer need not possess very high
"mathematical attainments; acute sight, and skill as a
"draughtsman, being his most important requisites; and his
"staff need not consist of more than two or three labourers,
"one of whom should be a practical mechanic.

"I am quite aware that there are some persons who will
"consider the sum that I have named above, and the mode-
"rate annual expenditure which would be required for a few
"years, a very unprofitable waste of public money. I feel
"also assured that your Lordship is not of their number; no
"man can be who has ever drunk of the fountain of know-
"ledge, or added to the domain of intellect. I feel confident
"that the public itself is not with them, and that it would

"resent as an insult the imputation of valuing at a mere "market price the only true elements of personal dignity or "national glory. If the spirit of the age be such that "the most despotic sovereigns of Europe feel that they "cannot avoid the necessity of encouraging physical science, "much more does it belong to the rulers of the freest and "most enlightened nation of the world; and it is due to your "Lordship and your colleagues to say, that we have always "found you to carry out in the fullest extent the requirements "of science.

"In hopes that in this instance, also, our appeal may not "be in vain,

"I have the honour to be,

"Your Lordship's obedient servant,

"T. R. Robinson,

"President of the British Association for the Advancement of Science."

"The Right Hon. the Lord John Russell."

On the 14th August, 1850, a reply to the Memorial was sent by the Lords of the Treasury, to whom it had been referred by Lord John Russell, in which the writer, stating this, says, "I am directed to inform you, with reference "thereto, that while my Lords entertain the same views as "those expressed by you, as to the interest attaching to such "observations, yet it appears to their Lordships that there is "so much difficulty attending on the arrangements, which "alone could render any scheme of this kind really beneficial "to the purposes of science, that they are not prepared to "take any steps without much further consideration.

"I am, &c.

"G. C. Lewis."

The Council reported to the meeting in 1851, at Ipswich, that they had communicated this reply to the Council of the Royal Society, who had concurred in the recommendation; accompanying the communication with an assurance that the British Association will not lose sight of this important object, and requesting the continued co-operation of the Royal Society. That the specific difficulties alluded to in this letter

had not been communicated by the Government; but that they entertained the hope that they were not of such a nature that time and further consideration would not remove them, and concluded by expressing their belief that the time was not far distant when the subject might be again and successfully brought under the consideration of her Majesty's ministers.

The Astronomer Royal, in his address at the same meeting, stated his opinion that when a more explicit plan had been formed, another representation would be accompanied with success.

At the meeting which was held at Belfast in the following year, 1852, the President, Colonel Sabine, thus referred to it in his address:—

"Among the subjects which are likely to come before the "Mathematical and Physical Section, there is none perhaps "of greater importance, or requiring more careful considera- "tion, than the question, whether the time is arrived when "the establishment of an Observatory in the Southern He- "misphere, furnished with instruments of suitable optical "power for the examination of the Nebulæ of the Southern "Heavens, and devoted exclusively to that branch of Sidereal "Astronomy, should be again brought under the considera- "tion of Her Majesty's Ministers. . . . . .

"In the discussions which took place at a former period, "the only difficulty which appeared to be apprehended in "reference to the successful working of such an establish- "ment, arose from a doubt whether mirrors of the required "magnitude could be repolished, as they would frequently "need to be, on the spot. This difficulty has now, it is un- "derstood, been entirely removed by the improvements which "the Noble Earl, the President of the Royal Society, to "whom science is so deeply indebted for the instrumental "means of prosecuting these researches, has made in the appa- "ratus for repolishing the mirrors, and in the instructions for "the guidance of those who may have occasion to employ it, "which his own great personal experience has enabled him to "prepare. In this happy country, in which men are free to "consider and to discuss the propriety of public support being "given to undertakings conducive to national honour, and are "encouraged to do so by the experience that public men of "all parties who succeed each other in administration, seek "to be guided by enlightened public opinion, we may justly "entertain the full conviction that measures which, from their

"intrinsic importance, deserve to be adopted, will, sooner or "later, obtain the consideration they merit. When such pro- "positions are brought in the first instance—as in the class "of subjects with which we are here concerned it is desirable "they should be—before those public bodies, which are justly "regarded as possessing the highest scientific authority in this "country, and as most competent to judge of them, they "cannot be too carefully considered and discussed, before, by "their adoption, they become invested with the authority and "weight which those bodies have it in their power to im- "part. But when after due deliberation they have been so "adopted, it is equally fitting that these public bodies should "be true to their own convictions, and should steadily per- "severe in urging, on all proper occasions, both publicly "and privately, the measures which they believe will add to "their country's honor. . . . . That an observatory "for the purpose specified, in a part of the globe where it can "render peculiar service, and where we possess facilities "which other nations do not possess, will ere long be estab- "lished, no one I believe entertains a doubt. The importance "was admitted by the Ministry to whom the recommendation "was made. The only question with them appearing to be "one of time."

A little further on he observes:—

"Hitherto the researches of sidereal astronomy, even in "their widest extension, had manifested the existence of "those forces only with which we are familiar in our own "solar system. The refinements of modern observation and "the perfection of theoretical representation, had assured us "that the orbits in which the double stars, immeasurably dis- "tant from us, revolve around each other, are governed by "the same laws of molecular attraction which determine the "orbits of the planetary bodies of our own solar system. "But the Nebulæ have revealed to us the probable existence "in the yet more distant universe, of forces with which we "were formerly wholly unacquainted. The highest autho- "rities in this most advanced of all the sciences, acknowledge "themselves unable even to conjecture the nature of the "forces which have produced and maintain the diverse yet "obviously systematic arrangement of the hosts of stars which "constitute those few of the spiral Nebulæ which have been "hitherto examined. Hence the importance of increasing

"our knowledge of the variety of forms in which the "phenomena present themselves, by a similar examination "of the Southern Heavens to that which Lord Rosse is "accomplishing in the Northern Heavens."

The following resolution was accordingly passed:—"That "it is expedient to proceed without delay with the estab- "lishment in the Southern Hemisphere of a telescope not "inferior in power to a three feet reflector; and that the "President, with the assistance of the following gentlemen, "viz., Lord Rosse, Dr. Robinson, Lord Wrottesly, J. C. "Adams, Esq., the Astronomer Royal, J. Nasmyth, Esq., "W. Lassell, Esq., Sir David Brewster, and E. J. Cooper, "Esq., be appointed to take such steps as they shall deem "most desirable to carry out the above resolution."

At the next meeting, held at Hull in 1853, the Council reported that the committee above named, having added to their number Sir John Lubbock, Sir John Herschel, John Phillips, Esq., and the officers and council of the Royal Society, had decided on the nature and size of the telescope, and the mode of mounting which they deemed most advisable, and had appointed a deputation to communicate with the Earl of Aberdeen, with the view of obtaining the sanction of her Majesty's Government, and the requisite funds for the construction of the telescope.

The Council added that the deputation was favourably received by Lord Aberdeen, and that they had reason to entertain the hope that the necessary funds for the construction of the telescope would be included in the estimates presented to Parliament in the next session.

Mr. Hopkins, the President, in his address, gives the following account of the proposal:—

"You are aware with what a noble devotion to science "Sir John Herschel spent several years at the Cape of Good "Hope in the examination of the Southern Heavens; but "his telescopic power was limited to that of a reflector of "18½ inches aperture. It is now proposed to send out to "some convenient station in the southern hemisphere a re- "flecting telescope with a mirror of 4 feet aperture. Mr. "Grubb, of Dublin, has undertaken to construct such an "instrument (should the plan proposed be adopted) under "the general superintendence of Lord Rosse, Dr. Robinson, "Mr. Lassell, and one or two other gentlemen. The "general construction of the instrument, and the best mode "of mounting it, have been decided on with careful

" deliberation, after consulting all the best authorities on the " subject.

" These important preliminaries being agreed upon, and " an estimate of the whole expense of the instrument having " been made by Mr. Grubb, the deputation appointed for the " purpose proceeded to wait on Lord Aberdeen, to ascer- " tain whether the Government were willing to bear the " expense which the plan proposed would involve. His " Lordship expressed himself without hesitation as favorable " to the undertaking; but said that since it involved a " grant of money it would be necessary to consult the " Chancellor of the Exchequer, who, supposing him to take " a favourable view of the subject, would probably bring " it before the House of Commons among the estimates of " the ensuing year. With this answer the deputation could " not be otherwise than perfectly satisfied. . . . Judg- " ing from all we know of Mr. Gladstone's enlightened " views on subjects of this nature, and the favorable manner " in which the House of Commons has always received pro- " positions for the advancement of science, we have, I think, " every reason to hope that my successor in this chair may " have the satisfaction of announcing to you another instance " of the liberality of the Government in their acceptance of " the plan proposed to them."

His successor, the Earl of Harrowby, in his address at Liverpool in 1854, stated, in reference to this subject—" You will regret to hear that, although the estimate was not objected to by the Government, it has not yet been submitted to Parliament. We must make some allowance for the pre-occupations of war."

In answer to some inquiries which I sent home last year, after my arrival in this Colony, I received the following answers from Dr. Robinson, one of the Committee:—" 1. " There was no formal engagement. Lord Aberdeen told us " that he approved; that he could give no definite promise " till he communicated with the Chancellor of the Exchequer, " but that he was confident no objection would be made. " Lord Rosse, who was spokesman, considered the matter " settled. But the war prevented any further proceedings. " 2. The telescope was recommended by the Committee to be, " on a proposal made by Grubb, 4 feet aperture, not ex- " ceeding 36 feet focus—probably 30—to be Cassegrainian. " It was to be equatorially mounted on a new plan proposed " by him, with clockwork. The estimate was £4,500, but

"the Committee asked Lord Aberdeen for £5,000. How-
"ever, the war prices of everything would require the esti-
"mate of everything to be raised now. 3. We prefer a re-
"flector, because to equal a 4-feet reflector in illuminating
"power would require a 3-feet achromatic, of which there is
"no chance in our time. Mertz, when questioned for a
"30-inch one, said, *if it were possible to make it*, the object
"glass alone would cost £9,000. As to tarnish, we contem-
"plate repolishing, which, on Lord Rosse's plan, presents no
"serious difficulty; and the estimate included a polishing
"machine and steam-engine to work it. 4. We contemplate
"mere nebulæ work, and perhaps satellites of Uranus and
"Neptune. The telescope was to be *sub dio*. The staff
"was to be—one observer, two labourers, and a mechanician,
"to be paid by the Admiralty."

As to the facility of re-polishing, I may quote a statement of Lord Rosse's, in answer to a question of Dr. Robinson on the possibility of its being practised with success by persons who had not had the long experience and mechanical knowledge of his Lordship? He (Lord Rosse) said that he had recently made many experiments with 3-feet specula in reference to the object of Dr. Robinson's question; and, in particular, had found that, by increasing the speed of the second eccentric in his machine, the process was rendered so much more certain, that desiring one of his workmen (a smith) to perform the whole process *without any superintendence* on his part, he produced a speculum, not perhaps absolutely perfect, but capable of doing excellent work. He had no doubt that any person of ordinary mechanical capacity would be able to do as much with a little instruction; and he would be most willing to give that instruction to any observer who might be placed in charge of a large reflector.

Though, in the later recommendations to the Government, no particular place was pointed out as the site for the erection of the telescope, it cannot be disputed that, even when not expressly mentioned, the Cape of Good Hope was the locality indicated by the Committee of the British Association, selected, probably, for the double reason of possessing already a working observatory, and as having been the scene of Sir John Herschel's labours in the same field; and should the expense of carrying out this proposal be defrayed by a vote of the English Parliament, there can be little doubt that that would be the spot selected.

But the latitude of Melbourne is nearly the same as that

of Cape Town. In transparency of atmosphere it can vie with any country in the world; as the metropolis of the great nation of the south, it possesses means and appliances, wealth and energy, with which no place on this side of the equator can enter into competition. But with these should come, also, the feeling that it is a duty to make use of them. It may be said that the English Government, now that the war is over, will resume their intention and carry out the views of the Committee. It may be so. All the louder, then, in my opinion, is the call on us to lose no time in seizing an opportunity, which seems specially offered to us, of proving to our friends at home, what they are but slow to believe, that we appreciate higher things than the gold we produce so abundantly, and that we value that gold chiefly as placing at our disposal the means of aiding every truly great and noble work. Our stepping forward now to carry out an object which has so long occupied the attention of the scientific world in England will at once place this Colony in the foremost rank of nations, patrons of science.

In the representations made to Her Majesty's Government, a re-survey of the southern nebulæ only was contemplated; and to the carrying out of this, some advantage would undoubtedly arise from the juxtaposition of the Cape observatory. But though this object only was aimed at, it must not be inferred, therefore, that there is no other astronomical work of importance which can only be done in a southern latitude. Upwards of seventy observatories, public or private, are constantly at work in the northern hemisphere, determining and catalogueing the places of the stars; and yet their work has not been exhausted. Stars may still be numbered by tens of thousands, of which either the positions have not been recorded, or the records depend on unsatisfactory observations. How much more, then, is there work to be done in the southern hemisphere, where two or three observatories only are engaged in the task. And yet it is on this steady work—little as may be the popular interest it possesses while in progress—as much as on the more brilliant observations which have been the subject of my communication this evening, that the determination of the laws which govern the motions of the vast cluster of suns, of which our sun is but an equal amongst equals, must ultimately depend. The accurate determinations which we now possess of some of the most important astronomical elements depend on the rough observations of the ancients. And who can say what revelations

regarding our system would not have been made now, if we possessed a map of the stars made a thousand years since which could boast a hundredth part of the accuracy of that which all the astronomers of the world are now engaged in producing. The effect of an error in depreciating an observation diminishes with the lapse of time; and, conversely, increased accuracy will enable the same riddle to be read in a shorter period.

This work, though at first sight it appears different, is really, in its ultimate object, identical with that done in careful observations of the nebulæ. In the one case, we are placed at a vast distance from the cluster we are observing, and can examine and record its appearances at different epochs, and from these can draw conclusions as to the arrangement and motions of the several bodies of which it is composed. In the other case, we are in the midst of such a cluster; and our mode of proceeding is to observe and record with the greatest accuracy to which our instrumental means will enable us to attain, the positions of the individual bodies of which our cluster is composed, that by comparing these positions at different epochs, we may deduce their motions, and analyse them into such as are actual motions of the stars, and such as are mere parallactic effects depending on the motion of our system, and from which the motion of our system may be determined. Such a series of observations, and the comparison based on it, will be incomplete, if one portion only of the heavens is taken into account.

To do this work efficiently, an Observatory, furnished with fixed meridian and prime-vertical instruments of the first class, is requisite; and the establishment of such an Observatory, in conjunction with the erection of the four-feet reflector, is a noble object, to which some portion of the apparently inexhaustible wealth of our gold-fields may be worthily devoted. It remains for the Philosophical Institute to say whether they will take any steps to draw the attention of the Legislature to the subject.